

MARKED-UP VERSION OF CLAIMS SHOWING AMENDMENTS

24. (Amended) An automatic workspace volume calibration method for use with a haptic interface, the calibration method comprising the steps of:
- initializing a position of the haptic interface;
 - rotating a rotary element of the haptic interface;**
 - tracking an angular orientation of the rotary element;**
 - determining a home position for the rotary element;** and
 - geometrically centering a user reference point in a workspace volume and a remote environment **by comparing the angular orientation of the rotary element with respect to the home position of the rotary element.**
26. (Amended) The automatic workspace volume calibration method of claim **24 25**, wherein an encoder is used to track the angular orientation ~~and determine the home position~~ of the rotary element.
27. (Amended) The automatic workspace volume calibration method of claim **24 25**, wherein a proximity switch is used to ~~track the angular orientation and~~ determine the home position of the rotary element.
28. (Amended) The automatic workspace volume calibration method of claim **24 25**, wherein a microswitch is used to ~~track the angular orientation and~~ determine the home position of the rotary element.
29. (Amended) The automatic workspace volume calibration method of claim **24 25**, wherein a potentiometer is used to track the angular orientation ~~and determine the home position~~ of the rotary element.
30. (Amended) A system for automatic workspace volume calibration of a haptic interface, comprising:
- at least one rotary element;
 - at least one flag disposed on the at least one rotary element;

a user interface connection for moving the at least one rotary element through a range of motion thereof; and

means for determining angular orientation of the at least one flag to geometrically calibrate the work volume.

31. (Amended) The system for automatic workspace volume calibration of a haptic interface of claim 30 further comprising:

a second flag disposed on the at least one rotary element and forming a gap between the at least one flag and the second flag; and

means for determining angular orientation of the second flag and the gap to geometrically calibrate the work volume.

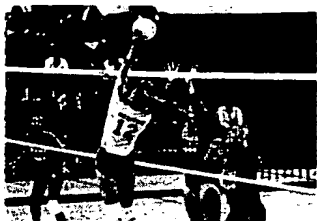
wool-sorter's disease See anthrax. { 'wül; sòrd-ərz di, zēz }
wool wax See wool grease. { 'wül, waks }
word [COMPUT SCI] The fundamental unit of storage capacity for a digital computer, almost always considered to be more than eight bits in length. Also known as computer word. { 'wórd }
word-addressable computer See word-oriented computer. { 'wórd ə, dres-ə-bəl kəm'pyüd-ər }
word boundary [COMPUT SCI] A storage address that is a multiple of the word length of a computer. { 'wórd, baún-drē }
word concatenation system [ENG ACOUS] The simplest form of voice response system, which retrieves previously spoken versions of words or phrases and carefully forms them into a sequence without pauses, to approximate normally spoken word sequences. { 'wórd kən, kat-ən'ā-shən, 'sistəm }
word format [COMPUT SCI] Arrangement of characters in a word, with each position or group of positions in the word containing certain specified data. { 'wórd 'fór, mat }
word length [COMPUT SCI] The number of bits, digits, characters, or bytes in one word. { 'wórd, 'length }
word mark [COMPUT SCI] A nondata punctuation bit used to delimit a word in a variable-word-length computer. { 'wórd, 'mārk }
word-oriented computer [COMPUT SCI] A computer in which the locations of words are addressed, and the bits and characters within the words can be addressed only through use of special instructions. Also known as word-addressable computer. { 'wórd, 'ór-ən-təd kəm'pyüd-ər }
word processing [COMPUT SCI] The use of computers or computerlike equipment to write, edit, and format text. { 'wórd, 'prā, ses-iŋ }
word processor [COMPUT SCI] 1. A computer that is either dedicated to word processing or is used with a software package that supports word processing, together with a printer. 2. A person who operates such a device. { 'wórd, 'prā, ses-ər }
word rate [COMPUT SCI] In computer operations, the frequency derived from the elapsed period between the beginning of the transmission of one word and the beginning of the transmission of the next word. { 'wórd, 'rát }
words per minute [COMMUN] A measure of the speed with which messages can be transmitted by a telegraph system. Abbreviated WPM. { 'wərdz pər 'mín-ət }
word time See minor cycle. { 'wərd, 'tīm }
word wrap [COMPUT SCI] A procedure whereby a word processor automatically ends each line when it is full and starts the next line with the next word, never breaking a word. Also known as wrap mode. { 'wərd, 'rap }
work [ELEC] See load. [IND ENG] The physical or mental effort expended in the performance of a task. [MECH] The transference of energy that occurs when a force is applied to a body that is moving in such a way that the force has a component in the direction of the body's motion; it is equal to the line integral of the force over the path taken by the body. { 'wərk }
workability [MATER] The ease with which concrete can be placed. { 'wərkə'bíl-əd-ē }
work angle [MET] In arc welding, the angle in a plane normal to the weld axis between the electrode and one member of the joint. { 'wərk, an'gəl }
work assembly [COMPUT SCI] The clerical activities related to organizing collections of data records and computer programs or series of related programs. { 'wərk ə, sem-blē }
work breakdown structure [IND ENG] A hierarchy designed to organize, define, and display all the work that must be performed in order to accomplish the objectives of a project. { 'wərk, brāk, daún, 'strə-k-čər }
work cycle [IND ENG] A sequence of tasks, operations, and processes, or a pattern of manual motions, elements, and activities that is repeated for each unit of work. { 'wərk, 'sī-kəl }
work design See job design. { 'wərk di, zín }
worked-out [MIN ENG] Exhausted, referring to a coal seam or ore deposit. { 'wəkt 'aút }
worked penetration [ENG] Penetration of a sample of lubricating grease immediately after it has been brought to a specified temperature and subjected to strokes in a standard grease worker. { 'wəkt, pen-ə'trā-shən }
work element [IND ENG] In planning a manufacturing process, a single task that cannot be subdivided. { 'wərk, 'el-ə-mənt }
worker [INV ZOO] One of the neuter, usually sterile individ-

uals making up a caste of social insects, such as ants, termites, or bees, which labor for the colony. { 'wərkər }
work file [COMPUT SCI] A file created to hold data temporarily during processing. { 'wərk, 'fíl }
work function [SOLID STATE] The minimum energy needed to remove an electron from the Fermi level of a metal to infinity; usually expressed in electronvolts. [THERMO] See free energy. { 'wərk, fəŋk-'shən }
work hardening [MET] Increased hardness accompanying plastic deformation of a metal below the recrystallization temperature range. { 'wərk, 'hārd-ən-iŋ }
working [COMMUN] Carrying on radio communication with a station by means of telegraphy, telephony, or facsimile for a purpose other than calling. [MIN ENG] 1. The whole strata excavated in working a seam. 2. Ground or rocks shifting under pressure and producing noise. [NAV] In sea ice navigation, making headway through an ice pack by boring, breaking, and slewing. { 'wərk-iŋ }
working area [IND ENG] A portion of the workplace in which a worker moves about while fulfilling work tasks. { 'wərk-iŋ, 'er-ē-ə }
working electrode [PHYS CHEM] The electrode used in corrosion testing by an electrochemical cell. { 'wərk-iŋ, 'i-lek, trəd }
working envelope [MECH ENG] The surface bounding the maximum extent and reach of a robot's wrist, excluding the tool tip. Also known as working profile. { 'wərk-iŋ, 'en-və, lōp }
working life See work life. { 'wərk-iŋ, 'līf }
working load [ENG] The maximum load that any structural member is designed to support. { 'wərk-iŋ, 'lōd }
working place [MIN ENG] The place in a mine at which coal or ore is being actually mined. { 'wərk-iŋ, 'plās }
working point [ARCH] A point that is designated on a construction drawing and is then used as reference for other points. { 'wərk-iŋ, 'póint }
working pressure [ENG] The allowable operating pressure in a pressurized vessel or conduit, usually calculated by ASME (American Society of Mechanical Engineers) or API (American Petroleum Institute) codes. { 'wərk-iŋ, 'presh-ər }
working profile See working envelope. { 'wərk-iŋ, 'prō, 'fíl }
working program [COMPUT SCI] A valid program which, when translated into machine language, can be executed on a computer. { 'wərk-iŋ, 'prō, 'gram }
working Q See loaded Q. { 'wərk-iŋ, 'kyü }
working set [COMPUT SCI] The smallest collection of instruction and data words of a given computer program which should be loaded into the main storage of a computer system so that efficient processing is possible. { 'wərk-iŋ, 'set }
working-set window [COMPUT SCI] A fixed time interval during which the working set is referenced. { 'wərk-iŋ, 'set, 'wín-dō }
working solution [GRAPHICS] A solution ready for use. { 'wərk-iŋ, səl-'yú-shən }
working space See working storage. { 'wərk-iŋ, 'spās }
working space-volume [MECH ENG] The volume enclosed by a robot's working envelope. { 'wərk-iŋ, 'spās, 'vāl-yəm }
working storage [COMPUT SCI] 1. An area of main memory that is reserved by the programmer for storing temporary or intermediate values. Also known as working space. 2. In COBOL (computer language), a section in the data division used for describing the name, structure, usage, and initial value of program variables that are neither constants nor records of input/output files. { 'wərk-iŋ, 'stōr-iŋ }
working voltage See voltage rating. { 'wərk-iŋ, 'vōl-tij }
work-kinetic energy theorem [MECH] The theorem that the change in the kinetic energy of a particle during a displacement is equal to the work done by the resultant force on the particle during this displacement. { 'wərk ki-'ned-ik, 'en-ər-jē, 'thir-əm }
work lead [MET] The electrical conductor connecting the source of current to the work in arc welding. Also known as ground lead; welding ground. { 'wərk, 'lēd }
work life [CHEM ENG] The period of time a resin or an adhesive will remain usable after it is mixed with a catalyst and other ingredients. Also known as pot life; working life. { 'wərk, 'līf }
Workman-Reynolds effect [GEOPHYS] A mechanism for electric charge separation during freezing of slightly impure water; when a very dilute solution of certain salts freezes rapidly, a strong potential difference is established between the solid and

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volleyball

as if in a volley: *volley musket shots at the attackers*. **2. Sports.** To strike (a tennis ball, for example) before it touches the ground. — *intr.* **1.** To be discharged in or as if in a volley. **2. Sports.** To make a volley, especially in tennis. **3.** To move rapidly, forcefully, or loudly like missiles: *The hailstones volleyed down. Charges and countercharges volleyed through the courtroom.* [French *volée*, from Old French, from Vulgar Latin **volāta*, from Latin *volare*, to fly.] — *vol'ley-er* *n.*

vol'ley-ball (vól'ē-ból') *n.* **Sports.** **1.** A game played by two teams on a rectangular court divided by a high net, in which both teams use up to three hits to ground the ball on the opposing team's side of the net. **2.** The large inflated ball used in this game. — *vol'ley-ball'er* *n.*

Vo-log-da (vól'ag-dá). A city of western Russia north-northeast of Moscow. It was founded in the mid-12th century by merchants from Novgorod and passed to Moscow in 1478. Population, 269,000.

Vólos (vól'ós', vól'ós). A city of eastern Greece in Thessaly on the Gulf of Vólos, an inlet of the Aegean Sea. Vólos is a major port and an industrial, commercial, and transportation center. Population, 171,378.

vol-plane (vól'plān', vól'-) *intr.v.* — *planed*, — *plan-ing*, — *planes*. **1.a.** To glide toward the earth in an airplane with the engine cut off. **b.** To glide toward the earth with the engine cut off. Used of an airplane. **2.** To make one's way or go by gliding. — *volplane* *n.* The act or an instance of volplaning. [From French *vol plané*, gliding flight: *vol*, flight (from Old French, from *voler*, to fly; see VOLLEY) + *plané*, gliding, past participle of *planer*, to glide; see PLANE³.]

Vol-sci (vól'skē, vól'sī, -sē, -shē) *pl.n.* A people of ancient Italy whose territory was conquered by the Romans in the fourth century B.C.

Vol-scian (vól'shān, vól'skē-ən) *adj.* Of or relating to the Volsci or their language. — *Volscian* *n.* **1.** The Italic language of the Volsci. **2.** A member of the Volsci.

Vol-stead (vól'stēd', vól'-, vól'-), **Andrew John**. 1860–1947. American legislator. As a U.S. representative from Minnesota (1903–1923) he sponsored the Volstead Act (1919), prohibiting the sale, manufacture, and transportation of alcoholic beverages.

volt¹ (vólt) *n.* *Abbr.* **V** The International System unit of electric potential and electromotive force, equal to the difference of electric potential between two points on a conducting wire carrying a constant current of one ampere when the power dissipated between the points is one watt. See table at **measurement**. [After Count Alessandro VOLTA.]

volt² also **volte** (vólt, vólt) *n.* **Sports.** **1.** A circular movement executed by a horse in manège. **2.** A sudden movement made in avoiding a thrust in fencing. [French *volte*, from Italian *volta*, turn, from *voltare*, to turn, leap. See VAULT².]

Vol-ta (vól'tá, vól't-, vól'-). A river formed in central Ghana by the confluence of the White Volta and the Black Volta and flowing about 467 km (290 mi) southward through artificial Lake Volta to the Bight of Benin in the Gulf of Guinea.

Vol-ta (vól'tá, vól'tā), **Count Alessandro**. 1745–1827. Italian physicist who invented the first electric battery (1800). The volt is named in his honor.

volt-age (vól'tij) *n.* Electromotive force or potential difference, usually expressed in volts.

voltage divider *n.* A number of resistors in series provided with taps at certain points to make available a fixed or variable fraction of the applied voltage.

vol-ta-ic (vól-tā'ik, vól-, vól'-) *adj.* **1.** Of, relating to, or being electricity or electric current produced by chemical action; galvanic. **2.** Producing electricity by chemical action. [After Count Alessandro VOLTA.]

voltaic battery *n.* An electric battery composed of a primary cell or cells.

voltaic cell *n.* See **primary cell**.

voltaic couple *n.* Two dissimilar conductors in contact or in the same electrolytic solution, resulting in a difference of potential between them. Also called **galvanic couple**.

voltaic pile *n.* A source of electricity consisting of a number of alternating disks of two different metals separated by acid-moistened pads, forming primary cells connected in series.

Vol-taire (vól-tār', vól-, vól-tēr'). Pen name of François Marie Arouet. 1694–1778. French philosopher and writer whose works epitomize the Age of Enlightenment, often attacking injustice and intolerance. He wrote *Candide* (1759) and the *Philosophical Dictionary* (1764).

vol-ta-ism (vól'tá-iz'm, vól'-, vól'-) *n.* See **galvanism** (sense 1). [VOLTA(IC) + -ISM.]

volt-am-me-ter (vól-tám'mē'tər, vól'tám'-) *n.* An instrument for measuring electrical current or potential.

volt-am-pere (vól'tám'pīr') *n.* A unit of electric power equal to the product of one volt and one ampere, equivalent to one watt.

Vol-ta Re-don-da (vól'tā rī-dōn'dá, -dōs'dā). A city of eastern Brazil on the Paraíba River west-northwest of Rio de Janeiro.

voltare, to turn; see VAULT²) + *faccia*, face (from Vulgar Latin **facia*; see FACE).]

volt-me-ter (vólt'mē'tər) *n.* An instrument, such as a galvanometer, for measuring potential differences in volts.

vol-u-ble (vól'ya-bəl) *adj.* **1.** Marked by a ready flow of speech; fluent. See Synonyms at **talkative**. **2.a.** Turning easily on an axis; rotating. **b. Botany.** Twining or twisting. [Middle English, moving easily, from Old French, from Latin *volūbilis*, revolving, fluent, from *volvare*, to roll. See **wel-2** in Appendix.] — *vol'u-bil'i-ty*, *vol'u-ble-ness* *n.* — *vol'u-bly* *adv.*

vol-ume (vól'yōm, -yām) *n.* **1. Abbr.** **vol., v.** **a.** A collection of written or printed sheets bound together; a book. **b.** One of the books of a work printed and bound in more than one book. **c.** A series of issues of a periodical, usually covering one calendar year. **d.** A unit of written material assembled together and cataloged in a library. **2. Abbr.** **vol., v.** A roll of parchment; a scroll. **3. Abbr.** **v.** **a.** The amount of space occupied by a three-dimensional object or region of space, expressed in cubic units. **b.** The capacity of such a region or of a specified container, expressed in cubic units. **4.a.** Amount; quantity: *a low volume of business*; *a considerable volume of lumber*. **b.** A large amount. Often used in the plural: *volumes of praise*. **5.a.** The amplitude or loudness of a sound. **b.** A control, as on a radio, for adjusting amplitude or loudness. [Middle English, from Old French, from Latin *volumen*, roll of writing, from *volvare*, to roll. See **wel-2** in Appendix.]

vol-umed (vól'yōmd, -yōmd) *adj.* **1.** Consisting of a volume or volumes. Often used in combination: *a large-volumed edition*; *a many-volumed novel*. **2.** Formed or moving in rolling or rounded masses: *volumed smoke*.

vol-u-me-ter (vól'yōm-mē'tər) *n.* Any of several instruments for measuring the volume of liquids, solids, or gases. [VOLU(ME) + -METER.]

vol-u-met-ric (vól'yōm-mēt'rik) *adj.* Of or relating to measurement by volume. [VOLU(ME) + -METRIC.] — *vol'u-met'ri-cal-ly* *adv.*

volumetric analysis *n.* **1.** Quantitative analysis using accurately measured titrated volumes of standard chemical solutions. **2.** Analysis of a gas by volume.

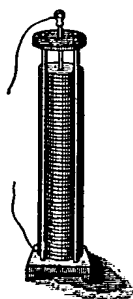
vo-lu-mi-nous (vā-lōd'mō-nās) *adj.* **1.** Having great volume, fullness, size, or number: *a voluminous trunk*; *a voluminous cloud*. **2.** Filling or capable of filling a large volume or many volumes: *the voluminous court record of the long trial*. **3.** Ample or lengthy in speech or writing. **4.** Having many coils; winding. [Late Latin *voluminōsus*, having many folds, from Latin *volumen*, *volumina*, roll of writing. See VOLUME.] — *vo-lu'mi-nos'i-ty* (-nōs'i-tē), *vo-lu'mi-nous-ness* (-nās-nīs) *n.* — *vo-lu'mi-nous-ly* *adv.*

vol-un-ta-rism (vól'an-tā-riz'm) *n.* **1.** The use of or reliance on voluntary action to maintain an institution, carry out a policy, or achieve an end. **2.** A theory or doctrine that regards the will as the fundamental principle of the individual or of the universe. — *vol'un-ta-rist* *n.* — *vol'un-ta-ris'tic* *adj.*

vol-un-tar-y (vól'an-tēr'ē) *adj.* **1.** Arising from or acting on one's own free will. **2.** Acting, serving, or done willingly and without constraint or expectation of reward: *a voluntary hostage*; *voluntary community work*. **3.** Normally controlled by or subject to individual volition: *Respiration is voluntary*. **4.** Capable of making choices; having the faculty of will. **5.** Supported by contributions or charitable donations rather than by government appropriations: *voluntary hospitals*. **6. Law.** **a.** Without legal obligation or consideration: *a voluntary conveyance of property*. **b.** Done deliberately; intentional: *voluntary manslaughter*. — *voluntary* *n., pl. -ies*. **1. Music.** **a.** A short piece of music, often improvised on a solo instrument, played as an introduction to a larger work. **b.** A piece for solo organ, often improvised, played before, during, or after a religious service. **2.** A volunteer. [Middle English, from Latin *voluntarius*, from *voluntas*, choice, from *velle*, *vol-*, to wish. See **wel-1** in Appendix.] — *vol'un-tar'i-ly* (-tār'i-lē) *adv.* — *vol'un-tar'i-ness* *n.*

SYNONYMS: *voluntary, intentional, deliberate, willful, willing.* These adjectives mean being or resulting from one's own free will. *Voluntary* implies the operation of unforced choice: "Ignorance, when it is voluntary, is criminal" (Samuel Johnson). *Intentional* applies to something undertaken to further a plan or realize an aim: "In whatsoever houses I enter, I will enter to help the sick, and I will abstain from all intentional wrongdoing and harm" (Hippocratic Oath). *Deliberate* stresses premeditation and full awareness of the character and consequences of one's acts: "In life courtesy and self-possession, and in the arts style, are the sensible impressions of the free mind, for both arise out of a deliberate shaping of all things" (William Butler Yeats). *Willful* implies deliberate, headstrong persistence in a self-determined course of action: *a willful waste of time*. *Willing* suggests ready or cheerful acquiescence in the proposals or requirements of another: "The first requisite of a good citizen . . . is that he shall be able and willing to pull his weight" (Theodore Roosevelt).

vol-un-tar-y-ism (vól'an-tēr'ē-iz'm) *n.* Reliance on voluntary contributions rather than government funds.



voltaic pile



Voltaire
1778 bust by
Jean Antoine Houdon